



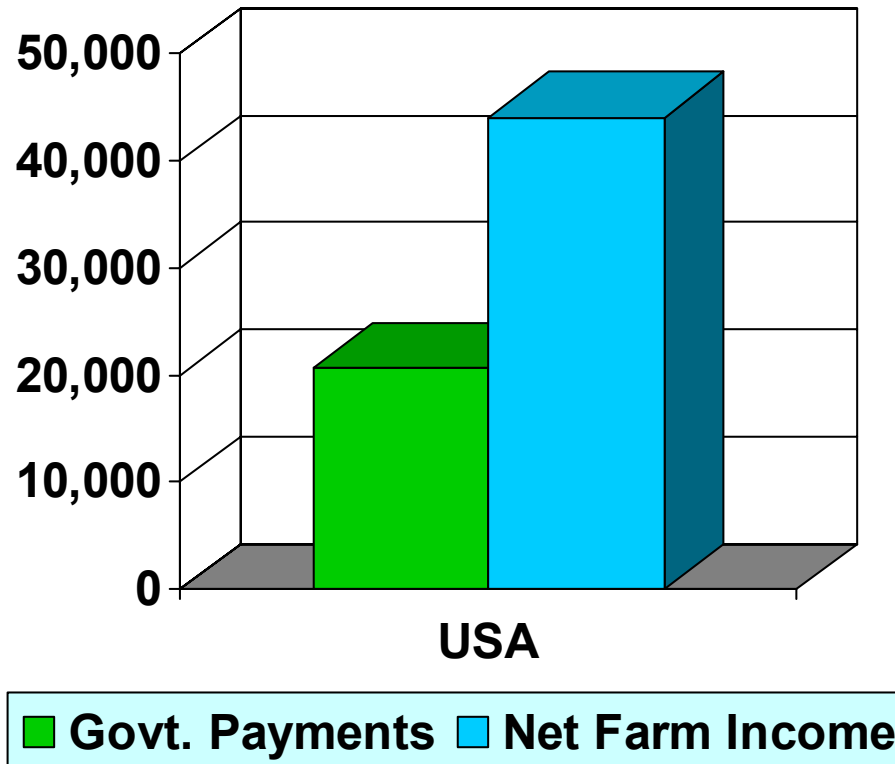
**A Potential Win-Win-Win for Energy,
Agriculture and the Environment:
A TVA-UT Partnership Proposal**

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Win, Win, Win

- **Energy**: More reliance on domestically produced, renewable energy sources, less dependence on foreign energy sources
- **Environment**: Provide a low-cost way to reduce greenhouse gases and pollution in the Tennessee Valley
- **Agriculture**: Increase farm prices and market incomes & reduce government farm payments

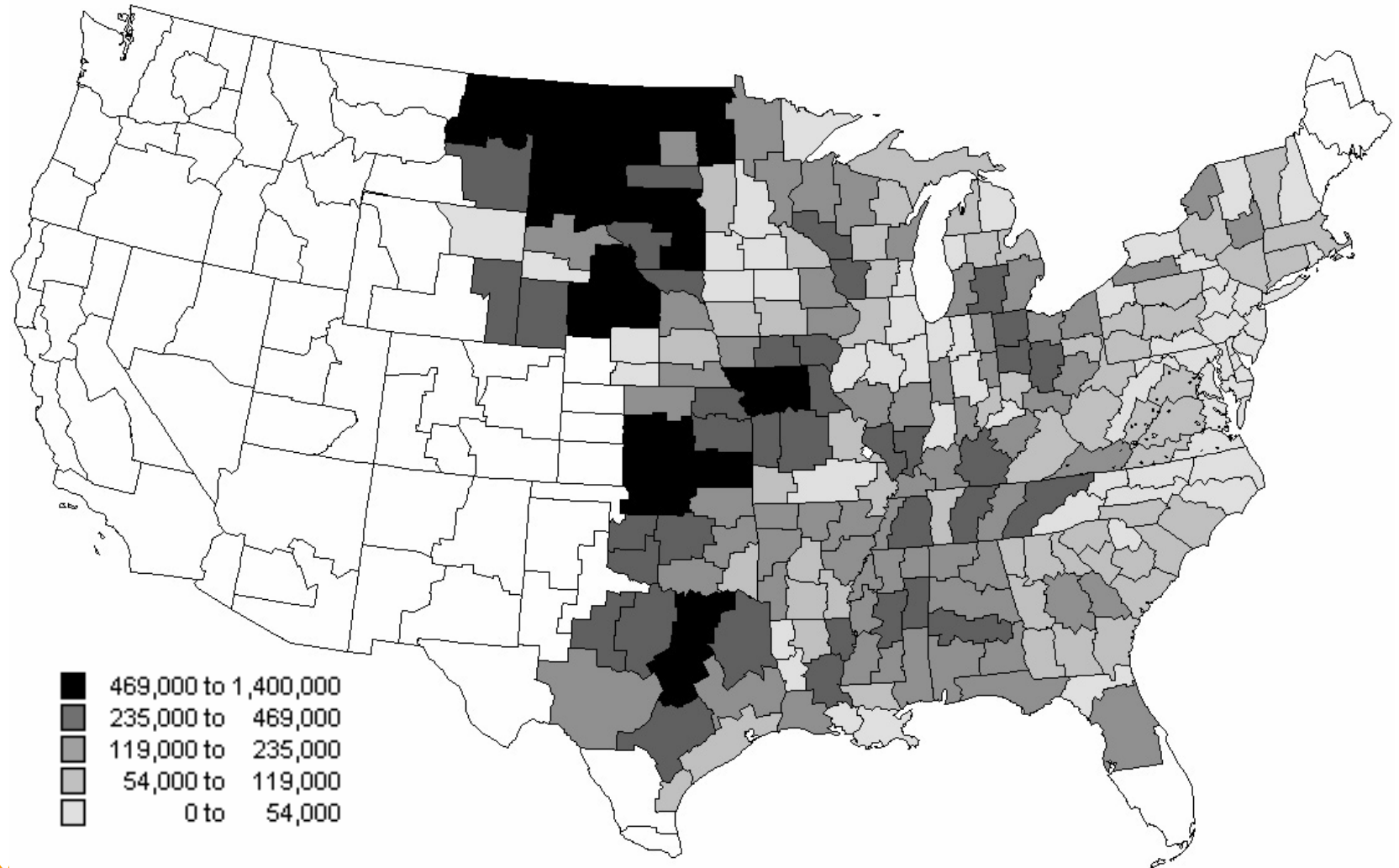
1999 Net Farm Income and Government Payments



The Bioenergy/Agriculture Connection

- Too many acres in crops to generate adequate market incomes in agriculture
- Farmers do not like to set-aside (idle) land; they like to farm
- Bioenergy Alternative: Transfer some land to a dedicated bioenergy crop
- For example, at \$40/dry ton, our analysis shows that switchgrass could replace 22 million acres currently in other crops (How much acreage is that? It would be equivalent to 1/3 the acreage currently in corn.)

22.23 Mil. Ac. Taken Out of Major Crops and Put Into Switchgrass



Bottom Line: Here is What We Found

Shifting 22 Million Acres to SwitchGrass Provided:

- Additional annual market returns for farmers—**adds \$4.2 billion**
 - Lets farmers farm, no set aside required
 - Land can be converted back to major crops later if needed
 - Competes at the land level; not the use level (in contrast to corn)
- Reduced annual government payments for agriculture—**saves \$1.8 billion**
- Furthermore, switchgrass is competitive with coal if half these benefits were used to help utilities purchase the switchgrass (lowers the cost to about \$20/dry ton)

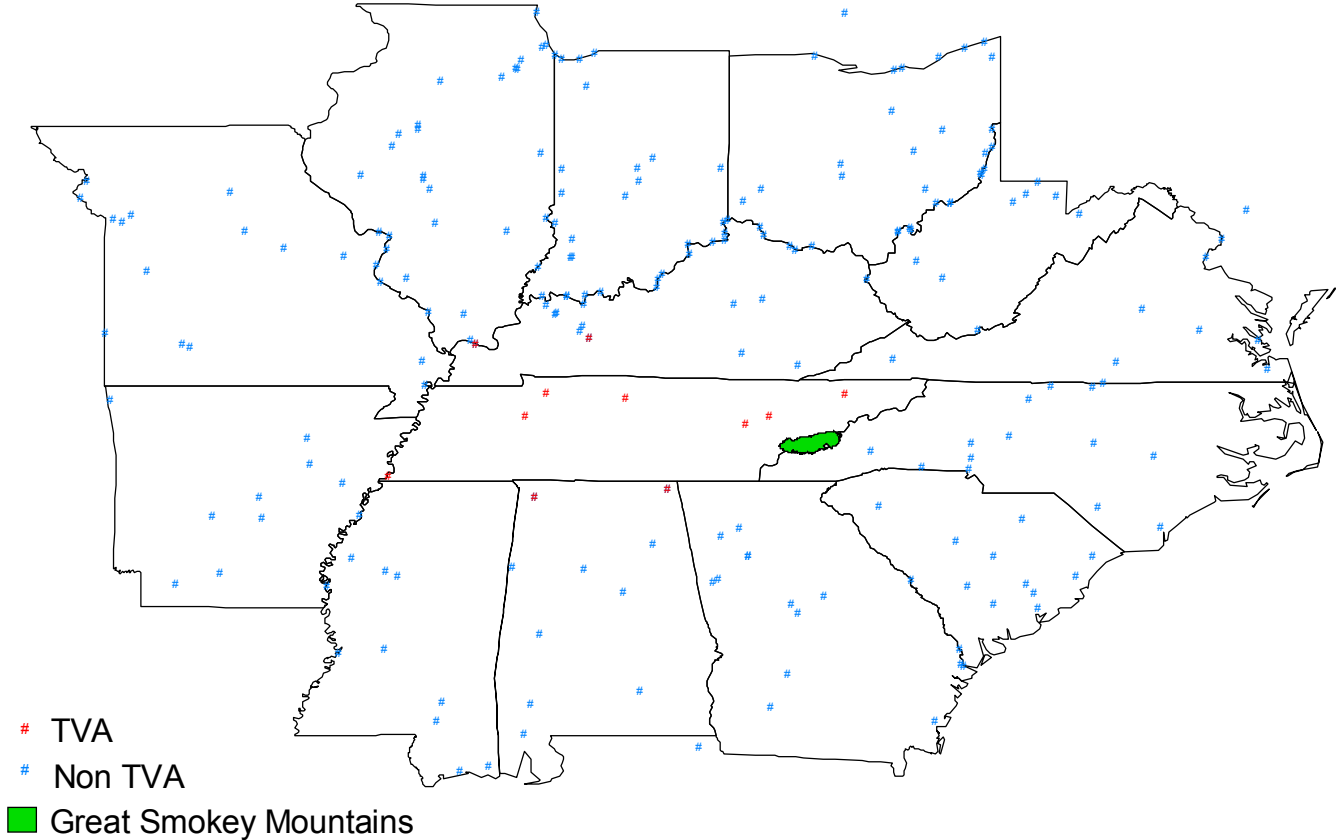
What is Needed Now?

- A systematic roadmap of how to get from where we are to a commercially sustainable biomass energy industry
- Viewed as an integrated system, need to identify and solve interrelated issues concerning:
 - Agronomic and farm production issues
 - Logistic and energy conversion issues
 - Economic and environmental costs and benefits

Overall Objective of the Proposed UT/TVA Project

- Solve the technical problems that would enable:
 - Farmers to produce, store, & transport switchgrass
 - Utilities to handle, prepare and co-fire switchgrass so as to ensure a sustainable business arrangement
- Be a pattern for similar operations in the rest of the country

Coal-Power Plants in Tennessee and Near-by States



Why in Tennessee?

- TVA is here.
 - Natural partner for jump-starting needed research on technical issues
 - Success of this project can be seamlessly transferred to plants in 7-state TVA region.
- Switchgrass may be a particularly profitable crop in Tennessee compared mid-western states
- Improvements in air quality are desperately needed in the Tennessee Valley and Smokie Mountains

Specifically...We Want To:

- Convert one unit (one generator) of TVA's Johnsonville coal-fired power facility to co-firing 10% with switchgrass
- Provide a market incentive to produce 6,000 acres of switchgrass in West Tennessee within 50 mile radius of the plant.
- Research agronomic, logistic, energy conservation, and farming system issues associated with commercially sustaining a biomass energy industry.
- Provide extension & education activities to successfully produce, transport, and burn switchgrass for energy.
- Evaluate the economic and environmental costs and benefits

UT/TVA Proposed Co-Firing Switchgrass with Coal Project, Selected Characteristics

Item	Units	As a Result of the Project	Full Adoption at Johnsonville
Land Converted to Switchgrass	Acres	6,000	60,000
Production of Switchgrass	Tons	43,000	430,000
Farm Revenue Generated	Million \$	1.72	17.20
Amount Electricity Generated	MWh/yr	62,600	626,000

UT/TVA Proposed Co-Firing Switchgrass with Coal Project, Potential Environmental Benefits

Item	Units	As a Result of the Project	Full Adoption at Johnsonville
SO₂ Reduced by	Million lbs/yr	1.6	16.3
CO₂ Reduced by	Million lbs/yr	145.6	1,456.3
NO_x Reduced by	%	0 to 17%	0 to 17%
Reduced Particulate as Measured by Opacity	%	Up to 60%	Up to 60%
Erosion Reduced by	Tons	12,600	126,000
Sediment Reduced by	Tons	5,000	50,000

UT/TVA Proposed Co-Firing Switchgrass with Coal Project, a Rare Win, Win, Win???

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